M2C2 A Short History

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ONR 30

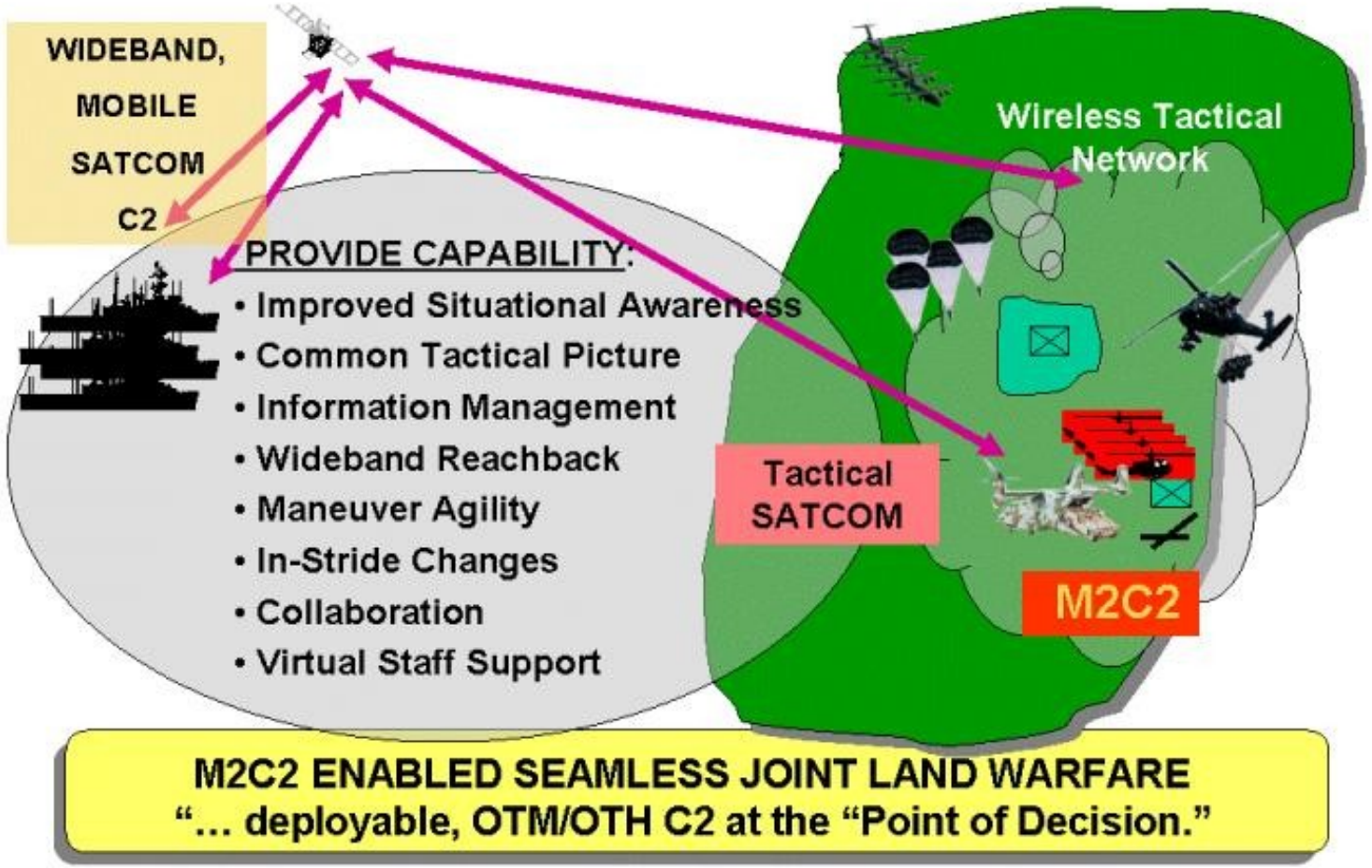
Briefing Outline
M2C2 Phase 1

- Background
- Operational Context
- Rationale
- Need
- Technical Description
- Team
- Contracting History
- Design
- Architecture
- SATCOM Antenna

Background

- Responding to expressed MARFORPAC need
  - Develop early entry Command & Control capability for amphibious ESG ops
  - For notional USMC Internally Transportable Vehicle
- Plus ups for Hawaii tech base development
  - FY03- $12.150M
  - FY04- $1.925M
  - FY05- $5.640M
  - FY06- $6.224M

Mobile Modular Command and Control (M2C2)



M2C2 RATIONALE
Early Entry/Expeditionary Force Need

- Consistent, reliable OTH/OTM digital capability at tactical level
- Single lift (V-22 internal/H60 external) transportable C2 vehicle
- Complete/timely situation awareness at tactical level
- Modular/scaleable capability package for mobility/transportability
- Minimal to no setup/teardown time
- Minimal to no degradation OTM or during displacement
- Sufficient reachback to all tactical information exchange programs
- Small/minimal footprint ashore
- Interoperability

COMMARFORPAC Need Continual CG Support

- R 200001Z NOV 01 ZYB PSN 432005L14
  - … ADDRESSES A GAP IN DATA COMMUNICATIONS FOR CONTROLLING JOINT FIRES AND MAINTAINING SITUATIONAL AWARENESS DURING THE FIRST HOURS AND DAYS OF AN ASSAULT.
  - … STRONGLY RECOMMEND THAT … CAPABILITIES BE AGGRESSIVELY PURSUED TO ENABLE OUR “KICK DOWN THE DOOR” MISSION.
- R XXXXXXZ APR 04 MARFORPAC
  - MARINE FORCES PACIFIC REMAINS COMMITED AND FULLY SUPPORTS THE … M2C2 CONCEPT TO ENABLE MORE AGILE, YET ROBUST, LETHAL ASSAULT FORCES.
  - … WILL LEVERAGE OFF EXISTING COMMUNICATION INFRASTRUCTURE AND BE CAPABLE OF DEPLOYMENT UNDER ANY CIRCUMSTANCES WHILE SUPPORTING EXISTING MILITARY C4 ARCHITECTURE

“Phase I” Technical Description

- Transportable, self-contained, vehicle-independent C3 package for USMC early-entry operations
- Wideband Ku-band SATCOM reach back while moving
- Secure wireless enclave
- VHF & UHF military line-of-site communications
- HF Communications
- UHF TACSAT
- Essential command and control functionality
- Collaboration capabilities
- Advanced Network Management
- Automated radio cross-banding and relay

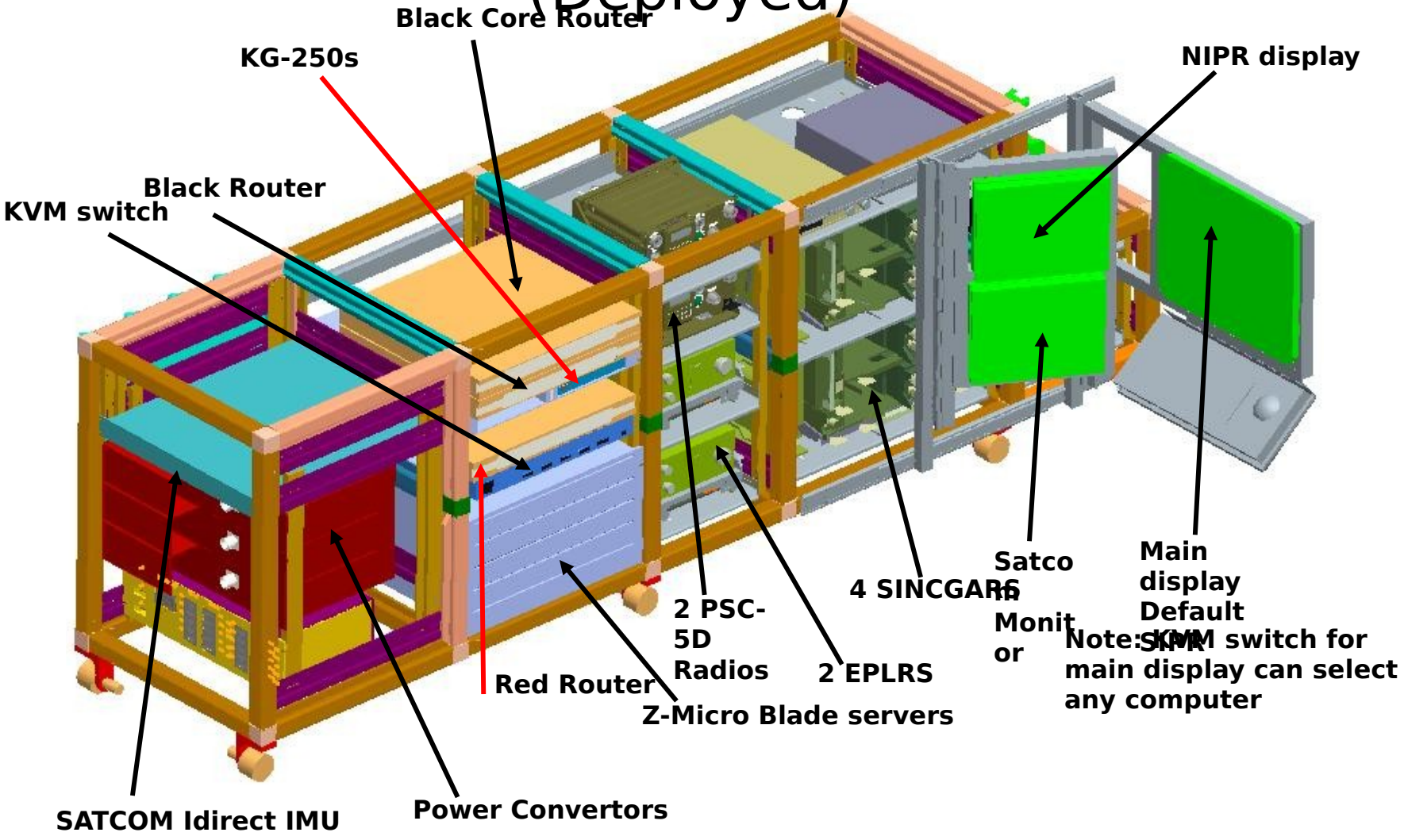
M2C2 “Phase I” TEAM

- Program/Technical Management – Office of Naval Research (ONR)
- Operational Assessment – MARFORPAC
- System Integration – Pacific Technologies
- Technical Assessment - SPAWAR Systems Center SD
- MARFORPAC Focus Team (Warfighter Advisers)
  - 3rd Marine Regiment
  - MarForPac G-3, G-6
  - MarCorSysCom
  - I and III MEF
  - HQMC C4
  - MCWL
- Hawaii-Based Technology Contractors
  - Multi-band antenna and multi-coupler – Akimeka
  - Compact L, C and Ku-band microstrip antennas – Oceanit
  - Network management – Referentia
- Maui High Performance Computing Center
  - Higher Headquarters Node during demonstration

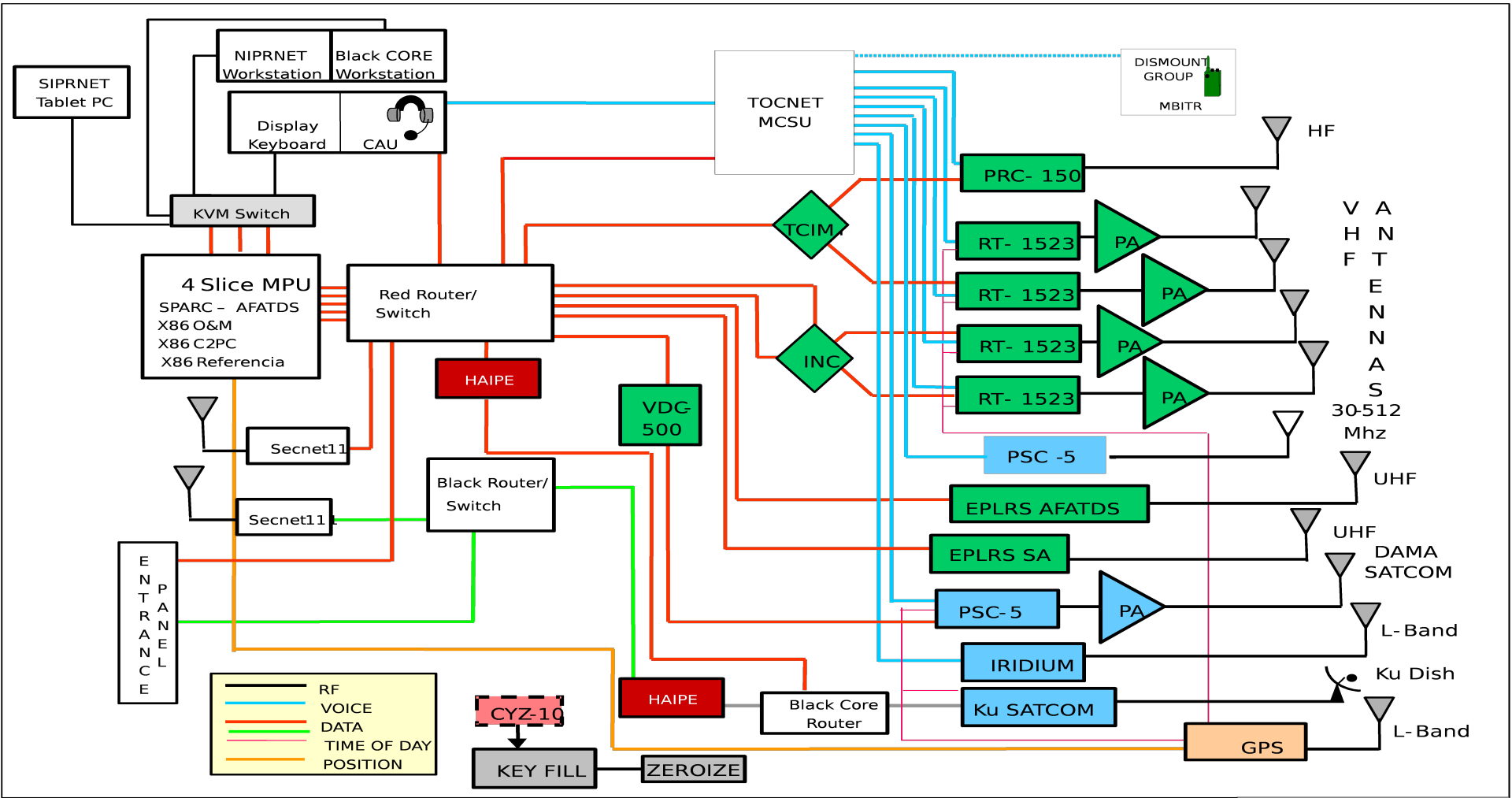
M2C2 Contracting History

- 1. **Pacific Technologies, LLC**, 733 Bishop Street, Honolulu, Hawaii 96813. Contract N00014-04-C-0479 to design, integrate and demonstrate an early-entry command, control and communications reach-back package. Included were: line-of-site military radios; broadband Ku SATCOM on the move; UHF TACSAT; secure wireless enclave for command center functions; essential command and control capabilities; and collaboration capabilities. Two packages were demonstrated by the 3rd Marine Regiment at the Mojave Viper exercise in October 2005.
- 2. **Akimeka, LLC**, 1600 Kapiolani Blvd, Suite 527, Honolulu, HI, 96814. Contract N00014-04-C-0477 to design, test and demonstrate a multi-band antenna and co-site interference mitigation capabilities. Contract N00014-04-D-0480/0001 to develop the M2C2 Training Strategy. POCs are Mr. Jeff Gaylord, (808) 943-9545, jgaylord@akimeka.com and Mr. Tony Ramirez, (808) 943-9545, tramirez@akimeka.com.
- 3. **Referentia Systems, Inc**., 550 Paiea Street, Suite 236, honolulu, HI 96819.Contract N00014-04-C-0478 to develop, test, and demonstrate quality of service, network management, and bandwidth management tools. POCs Mr. Nelson Kanemoto, 808-423-1900, kane@referentia.com and Mr. Larry Cutshaw, lcutshaw@referentia.com, 808-423-1900.
- 4. **Oceanit Laboratories, Inc**., 828 Fort Street Mall, Suite 600, Honolulu, HI 96813. Contract N00014-04-C-0473 to develop, test and demonstrate, compact UHF, L-band, and C-band antennas, and compact low-cost Ku phased array SATCOM antenna. POC is Dr. Ken Cheung, 808-531-3017, x118, kcheung@oceanit.com.

M2C2 Phase 1
Design & Construction Display set (Deployed)



M2C2 Phase 1 Architecture



Title: M2C2 CDR System Block Diagram	Filename: CDR_Drawings	Release Date 4/25/05	Raytheon
Project: M2C2 / JEEP	Version: -	Author: Killian	Page 1

M2C2 Phase 1
Network Architecture

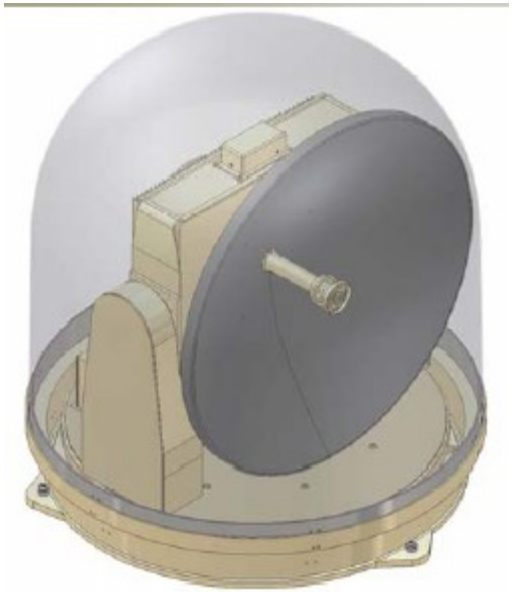
- Cisco Routers: 1 Red (SIPRNet), 1 Black (NIPRNet) , and 1 Black Core
- 2 AltaSec HAIPE KG-250s
- 4 Z-Micro Blade servers
- TCIM
- MCSU
- KVM Switch
- VDC – 500
- Harris SECNet 11
- Converged IP network
  - NIPRNet and SIPRNet (or other type 1 networks) connect through HAIPE to black core
  - QoS implemented in all routers
  - Policies generated and maintained by operator and network planners
  - Cisco Security Device Manager provides wizards and GUIs which simplify
  - Command line Interface to the router still available

M2C2 Phase 1 Communications Architecture

- Soft CAU
- DAGR (GPS)
- SECNet 11 Wireless LAN
- 1 PRC-150 radio (HF)
- 4 SINCGARS RT-1523Es (VRC-92Fs) (VHF)
- 2 PSC-5D radios (UHF and UHF TACSAT)
- 1 Iridium (Satcom Voice connectivity and low data rate service)
- 2 EPLRS radios (UHF – AFATDS and C2PC currently)
- Idirect IMU (TALIN 2000) for SATCOM Ku Band
- RSI 0.6 meter SATCOM Ku Band On-The-Move (OTM) parabolic antenna
- 4 OTM Multi-Element UHF/VHF antennas
- 1 OTM TACSAT antenna
- 1 OTM HF Loop antenna

OTM SATCOM Ku Band Antenna

- Data Rate between units:
  - 1544 kbps, ¾ rate outbound
  - 512 kbps, ¾ rate inbound
  - QPSK, full duplex
  - Uplink Power Required: 49.6 dBw



- Vertex RSI SATCOM on the move terminal supports a maximum uplink EIRP of 50 dBw. Data rate of ¾ rate 512 kbps could be supported.

M2C2 Prototype at Mojave Viper October 2005

M2C2 successfully demonstrated both the technical feasibility and operational utility of C2 on the move using wideband

M2C2 Network/Communications Overview

Communications include Ultra High Frequency (UHF) and Very High Frequency (VHF), High Frequency (HF), L-Band, Ku Band (Satellite), DAMA SATCOM, and Global Positioning System (GPS). The various associated communications receivers include the AN/PRC-150, SINCGARS RT-1523E, AN/PSC-5D, EPLRS, IRIDIUM, Ku SATCOM, and GPS. With the exception of the GPS antenna, all of the receivers connect into a Tactical Operations Center Inter-Communication System (TOCNET) Micro Central Switching Unit (MCSU). There are inputs from the VHF antennas into a Tactical Communications Interface Module (TCIM) and INC (SINCGARS RT-1523 data interface). The Demand Assigned Multiple Access (DAMA) SATCOM feeds into a VDC 500 Unit prior to connecting to the M2C2 "Red" Router/Switch ("Red" equates to classified Secret Data). The DAMA SATCOM and one of the VHF (RT-1523E) receivers also receive a timing signal from the GPS unit. The Ku SATCOM connects into a WAN Router as well as through dual High Assurance Internet Protocol Encryption (HAIPE) devices (AltaSec KG-250s), one leading to the "Red" Router/Switch and the other leading to the "Black" Router/Switch ("Black" equates to Sensitive but Unclassified (SBU) data). The HAIPE devices prevent the possibility of "Red" data flowing into the "Black" data stream (or vice versa). The "Black" Router connects to a Harris SECNet 11 plus Wireless LAN that provides reachback to NIPRNet. The "Red" Router/Switch connects to a 4 "Slice" Multi Processor Unit (MPU), a Harris SECNet 11 plus Wireless LAN (Secret), the TOCNET MCSU, the TCIM and INC (coming from the VHF radio suite), the VDC 500 (coming from the DAMA SATCOM radio), the HAIPE (coming from the WAN router and Ku SATCOM, and the Communication Access Unit (CAU or communications headset). A Keyboard Video Mouse (KVM) switch services both NIPRNet and SIPRNET keyboards and monitors.